

A NEW SPECIES OF CARCINONEMERTES
(NEMERTEA: CARCINONEMERTIDAE) WITH NOTES
ON THE GENUS FROM THE PACIFIC COAST

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Abstract.—The carcinonemertean egg predator living on the host crab, *Cancer magister* Dana, 1852, is described and designated as the new species, *Carcinonemertes errans*. *C. errans* is compared with *C. epialti* Coe, 1902, the only previously described carcinonemertean from the Pacific coasts of North America. Both these species are compared with the described congeners from the Atlantic and Mediterranean regarding the location of juvenile worms on the host's exoskeleton.

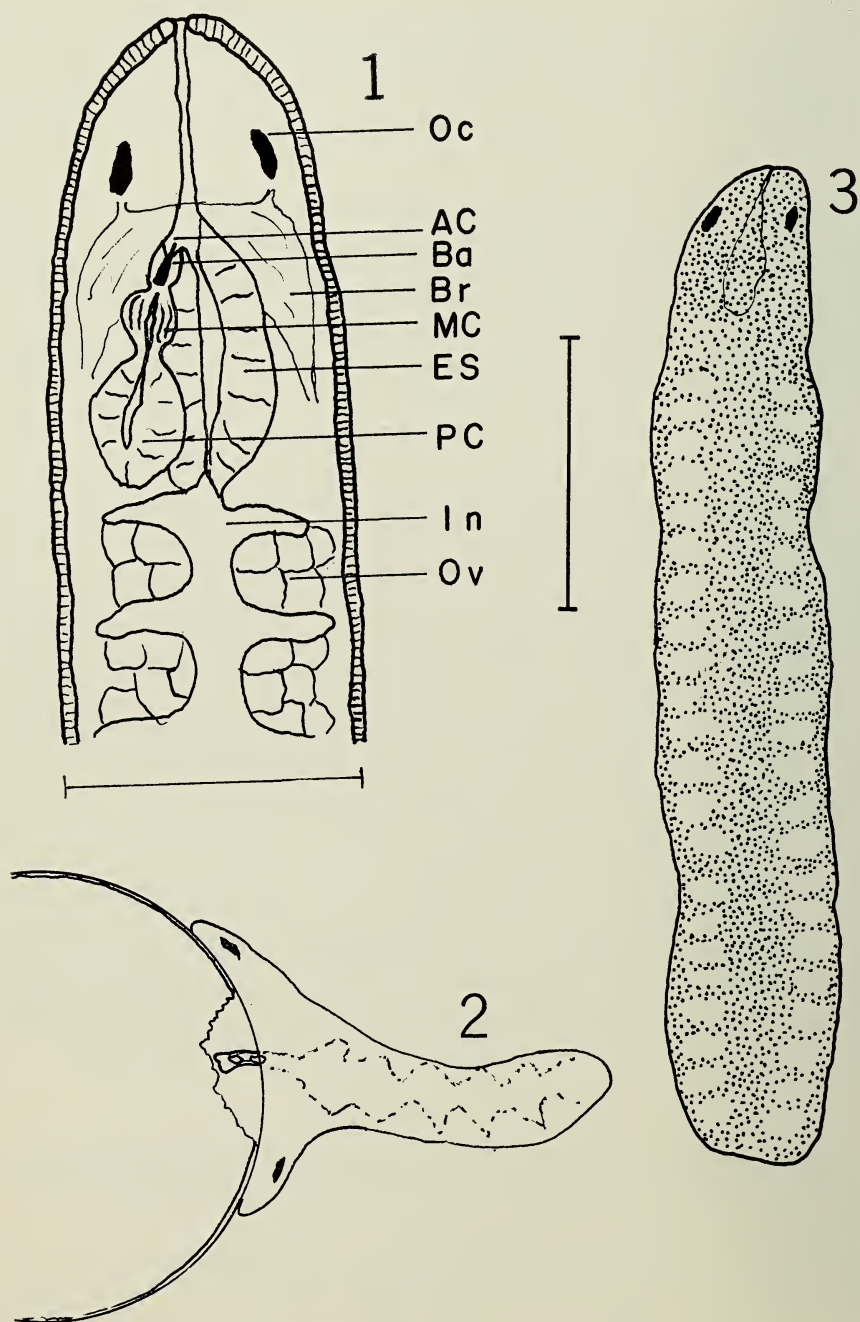
Members of the genus *Carcinonemertes* are nemerteans which live on the exoskeleton of brachyuran crabs and feed on their eggs (Humes, 1942). Only one species, *Carcinonemertes epialti* Coe, 1902, has been described from the Pacific coast of North America. This worm was described by Coe from the host crab *Pugettia* (= *Epialtus*) *producta* (Randall, 1839) from Monterey, California. Humes (1942) recorded *Euphylax dovii* Stimpson, 1860, from Peru as a host, and Kuris (1971) tentatively added *Hemigrapsus oregonensis* Dana, 1851, *Cancer productus* Randall, 1839, *Cancer antennarius* Stimpson, 1856, *Cancer gracilis* Dana, 1852, and *Cancer magister* Dana, 1852, from California as hosts and provided the first quantitative treatment of its effect on host reproduction. MacKay and Weymouth (1942) were the only other workers to note the presence of what were probably *Carcinonemertes* on *C. magister* but were unable to identify them.

During the course of studies of nemerteans on crabs from the San Francisco, California region, I observed several important differences between the nemertean on *C. magister* and that originally described as *Carcinonemertes epialti* by Coe. The differences were of such magnitude that it became clear that the species under study was an undescribed member of the genus *Carcinonemertes*. The description of the species follows.

Carcinonemertidae

Humes' (1942) diagnosis of the family Carcinonemertidae has been modified to facilitate the inclusion of the new species. Modifications are in italics.

"Monostiliferan hoplonemerteans living as ectohabitants on the gills, under the abdomen, in apodemes and axillae of the limbs, and in and on the egg masses of crabs. One central stylet, no accessory stylet pouches or accessory stylets. Proboscis very short, reaching scarcely beyond the



Figs. 1-3. *Carcinonemertes errantia*. 1. Anterior portion of body of living worm from dorsal surface. Oc, ocellus; Ac, anterior proboscis chamber; Ba, basis and stylet; Br, branchiae; MC, metacerebral chamber; ES, esophagus; PC, pharynx; In, intestine; Ov, ovary.

posterior end of the muscular part of the esophagus. Anterior chamber of the proboscis extremely short and non-glandular. Lateral nerves lie internal to the massively developed submuscular glands. Cephalic glands well developed. No cerebral sense organs. Cephalic muscle fibers present. Excretory apparatus apparently absent. Dorsal blood vessel absent. Takakura's duct present in males. Internal fertilization and viviparity commonly occur. Extensive development of eggs and spermatozoa. *In most species*, mucous sheath secreted, attached to endopodite hairs of ovigerous crabs."

The family includes one genus, *Carcinonemertes*, with 5 species, *C. carcinophila carcinophila* Kolliker, 1845, *C. epialti* Coe, 1902, *C. carcinophila imminuta* Humes, 1942, *C. mitsukurii* Takakura, 1910, *C. coei* Humes, 1942, and *C. errantia* described as follows.

Carcinonemertes errans sp. nov.

Genus *Carcinonemertes*

Body short, round, sexually mature females 4–6 mm in length, .5 mm in width; males shorter; juveniles flattened, $.90 \pm .05$ mm in length, $.30 \pm .01$ mm wide; head not demarcated from body, without cerebral grooves.

Color pink to reddish orange; epidermis furrowed longitudinally; opaque due to numerous white spots becoming more transparent in sexually mature, large worms; head lighter color; preserved specimens opaque off-white.

Single pair of ocelli near tip of head; irregular, $27 \times 13 \mu\text{m}$; bilobed brain on either side posterior to ocelli. Proboscis small, armed with single stylet; accessory stylets absent; posterior chamber with thickened, glandular walls; chamber elongated, approximately $100 \times 50 \mu\text{m}$; middle chamber round, thinner walled than posterior; approximately $40 \mu\text{m}$ in diameter; anterior chamber thin walled and narrow (Fig. 1).

Stylet surrounded by glandular cells; basis $35.1 \pm .3 \mu\text{m}$ in length, slightly tapered from posterior to anterior, approximately $10 \mu\text{m}$ in diameter at posterior, $5 \mu\text{m}$ in diameter at anterior; stylet $11.0 \pm .2 \mu\text{m}$.

Esophagus large, everted during feeding (Fig. 2); intestine straight with several lateral pouches on both sides.

Mature females with 20–25 ovaries on each side of body between gut pouches. Sexual maturity first externally apparent when ovaries appear as single row of transparent spots on both sides of body (Fig. 3); gut

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brain; Mc, middle proboscis chamber; Es, esophagus; Pc, posterior proboscis chamber; In, intestine; Ov, ovary. Scale = .5 mm. 2. *C. errans* feeding on egg of *C. magister*. Esophagus used in sucking particles of egg yolk into intestine. 3. Dorsal view of live *C. errans*. Ovaries becoming visible as rows of transparent spots on both sides. Scale = 1.0 mm.

Table 1. Lengths (μm) of components of the proboscis armature from worms taken from the various Pacific coast host crabs. All except *P. producta* were from the Bodega Bay area. *P. producta* were collected from Santa Barbara and Monterey, California, since no carcinomereans are present on *P. producta* north of Monterey. *F* ratio is for pairwise ANOVA testing the significance of the differences between the mean measurements from *C. errans* with *C. epialti* from each host.

Worm	Host	n (worms)	Basis	Stylet	Total
<i>C. errans</i>	<i>Cancer magister</i>	62	$35.22 \pm .33$	$11.01 \pm .16$	$46.23 \pm .38$
<i>C. epialti</i>	<i>Pugettia producta</i>	44	$31.95 \pm .43$ ($F = 36.8 P < .001$)	$10.20 \pm .13$ ($F = 13.2 P < .001$)	$42.15 \pm .44$ ($F = 48.52 P < .001$)
	<i>Hemigrapsus oregonensis</i>	19	$31.63 \pm .50$ ($F = 30.2 P < .001$)	$10.58 \pm .20$ ($F = 1.89 P < .25$)	$42.21 \pm .50$ ($F = 29.8 P < .001$)
	<i>Cancer anthonyi</i>	33	$33.18 \pm .41$ ($F = 14.5 P < .001$)	$10.70 \pm .20$ ($F = 1.42 P < .25$)	$43.82 \pm .44$ ($F = 15.8 P < .001$)
	<i>Cancer productus</i>	31	$31.9 \pm .44$ ($F = 36.0 P < .001$)	$9.94 \pm .20$ ($F = 16.4 P < .001$)	$41.84 \pm .42$ ($F = 35.5 P < .001$)
	<i>Cancer antennarius</i>	23	$32.65 \pm .51$ ($F = 17.6 P < .001$)	$10.57 \pm .18$ ($F = 2.27 P < .25$)	$43.18 \pm .61$ ($F = 17.82 P < .001$)
	<i>Cancer gracilis</i>	29	$31.97 \pm .44$ ($F = 31.5 P < .001$)	$10.34 \pm .18$ ($F = 6.22 P < .025$)	$42.24 \pm .48$ ($F = 39.16 P < .001$)

pouches and ovaries become visible when females fully mature, less obvious in males.

Found only on crab *Cancer magister*; juveniles on surface of exoskeleton within limb axillae and under abdomen; adult on and in host egg mass.

Type-locality.—Bodega Bay, Sonoma County, California (38°18'N, 123°2'W).

Range.—Continuous from Pacifica, Ca. (37°40'N, 122°30'W), to Auke Bay, Alaska (58°25'N, 134°30'W).

Type-material.—The following have been deposited at the National Museum of Natural History (Smithsonian Institution): Holotype: Mature female, 3 mm long, collected 27 December 1976, USNM 55171. Paratypes: 1 lot; 6 females, 2 males, 1 eggstring attached to eggs of host *C. magister*, collected 27 December 1976, USNM 55172. Additional specimens have been deposited at Bodega Marine Laboratory, Bodega Bay; the California Academy of Sciences, San Francisco; and at the British Museum (Natural History), London.

Etymology.—The specific name is derived from the Latin adjective *errans*, meaning wandering (things). This species moves freely about in the host egg mass since it lacks a mucous sheath.

Discussion.—*C. errans* differs from *C. epialti* by the presence of numerous small (1–2 μ) spots in the epidermis which results in an opacity that obscures the gut pouches in worms not fully mature. The gut pouches in *C. epialti* show clearly through its transparent epidermis resulting in a striped appearance. Drawings by Humes (1942) suggest a transparent epidermis in *C. carcinophila* although no specific mention of it is made.

The length of the proboscis armature in *C. errans* is significantly longer than that in *C. epialti* from its type host *Pugettia producta* as well as in worms from the other hosts. Work in progress suggests that worms from certain hosts other than *P. producta* may be distinct from *C. epialti* but they are not considered so for the present. Table 1 shows the length of the basis and stylet of worms from the various hosts.

Carcinonemertean from the Pacific coast of North America differ from their Atlantic counterparts in one important feature. In the Atlantic and Mediterranean, worms on non-egg-bearing crabs are found encysted between the gill lamellae of their hosts. This feature prompted the first observers to consider them ectoparasites on the gills (Coe, 1902). *Carcinonemertes* on the Pacific coast, however, do not encyst themselves on the host gills. Kuris (in press) found them ensheathed in various sites on the exoskeleton of the host *H. oregonensis* but never on the gills. *C. errans* juveniles were never found specifically ensheathed anywhere. They cling to the host exoskeleton with the aid of copious mucous secretion. They can be found under the abdomen, surrounding the base of the limbs and mouthparts, in the eyesockets, in the limb joints, in the apodemal in-

vaginations and in the entrance of the branchial chambers, but never on the gills.

Hopkins (1947) also noted that two types of worms could be found in the gills of *Callinectes sapidus* depending on whether or not the host had spawned during its life or not. Large, bright red worms were found along with small white worms. The larger worms were presumed to be worms which had already spent at least one reproductive period in the host egg mass and would, therefore, be iteroparous. Juvenile worms on non-egg-bearing hosts on the Pacific coast all appeared to be small and light pink in color. There was little size variation, and it is probable that these worms are semelparous.

The observations of actual worm feeding support Humes' (1942) and Kuris' (1971) contention that they are egg predators. Wickham and Fisher (1977) showed that on *C. magister* a high correlation existed between the number of worms present in an egg clutch and the number of dead eggs with some particularly dense samples exhibiting virtually complete mortality of the eggs.

Acknowledgments

I would like to thank Armand Kuris, Pamela Roe, and Cadet Hand for their assistance in preparing this manuscript.

This work is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce, under Grant #04-6-158-44110. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

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